

more intensive spectrum utilization. Specifically, it seeks comment regarding the additional cost to consumers of receivers with state-of-the-art immunity, and design considerations other than cost that as a practical matter limit interference immunity.

As the Commission accurately notes, expensive receivers *could* be designed and manufactured that have superior immunity to adjacent signals. However, in the context of the AM and FM broadcast bands, there are an estimated 600 million existing analog receivers whose performance must be considered in relaxing existing interference rules. The receiver design equation for future receivers is heavily influenced by cost and design/application considerations beyond the control of IBOC DAB proponents. To foster as rapid a transition as possible, it is in the public interest to minimize the cost of new digital receivers.

Comment also is sought on possible DAB spectrum efficiency standards and whether any Eureka-147 DAB and/or satellite DARS signal bandwidth and interference protection standards are relevant in establishing DAB spectrum efficiency standards for IBOC and/or non-IBOC DAB systems.

The Commission also seeks comment from IBOC system proponents on the need for sidebands in the all-digital mode. Comment is sought on the spectrum efficiency of the current IBOC system designs generally and, in particular, on using 400 kHz FM and 20 kHz AM channel bandwidths in the all-digital IBOC mode. The Commission also asks whether a signal architecture that shifts audio carriage from sidebands to a center-band in an all-digital environment is inherently more spectrally efficient than one which continues to operate on the basis of sidebands; and whether spectrum may be returned at the end of the licensees' IBOC transition to all-digital broadcasting.

Should there be different data capacity criteria during and after the transition to all-digital operations? Would the transition to all-digital service be slowed if incumbents were assigned less bandwidth for all-digital operations than their current channel assignments? Is preserving (or expanding) current AM and FM bandwidth assignments necessary for consumers to receive the full benefits of DAB, including a rapid implementation of an all-digital DAB system?

Lucent's IBOC AM and FM systems have been designed to work within the framework of existing protection criteria. Given the need to be backward compatible with analog systems, current interference protection standards must be maintained throughout and after the transition to an all-digital environment. Therefore, in the context of an IBOC migration approach, interference protection standards of new spectrum and satellite DARS digital systems are not relevant.

In its IBOC system, Lucent has optimized the design to deliver the highest quality audio possible with robust performance and coverage equivalent to that of analog. Delivering CD quality stereo, as in the FM hybrid system, requires 128kbps of bandwidth. Incorporating multi-streaming PAC™ technology, Lucent's FM hybrid system is able to achieve robust performance on impaired channels, enabling independent operation of the digital (sideband) signal. In the FM all-digital system, higher levels of robustness can be delivered using 128kbps for CD quality stereo, or using the 300 kbps (entire bandwidth of the center channel) to deliver multi-channel CD quality output.

On the other hand, in the AM hybrid solution FM-like quality can be generated at 48 kbps with an adequate level of performance superior to that of AM analog. However, given the bandwidth constraints of AM channels the all-digital system would require use of the full 64 kbps (entire 20 kHz channel) to deliver FM quality stereo output.

The new capacity for improved audio and new services obtained by transitioning to digital will be maximized in the all-digital mode in both AM and FM systems. We believe that broadcasters should be allowed to transition to all-digital as rapidly as the marketplace permits, and that this transition will also benefit the public in terms of greater quality and new services provided. Given the public benefits accrued from a transition to digital, existing broadcasters should have both the requirement and the financial responsibility for implementation. In return, they should be allowed to reap the benefits of making this transition. Establishing such incentives will remove unnecessary hurdles in the digital transition process, catalyzing the marketplace to generate momentum for innovative audio and digital multimedia broadcast services.

With regard to the digital sidebands, in the AM all digital situation 20 kHz is the minimum bandwidth needed to deliver FM quality stereo sound, which will reduce the audio quality disparity between AM and FM broadcasters. With respect to the FM all-digital case, the assignment of 200 kHz center channel with sidebands offers a long-term advantage of maximizing spectrum utilization. The continuing use of sidebands in the all-digital mode ensures backward compatibility with the hybrid mode, thereby allowing us to introduce a more advanced version of an all-digital mode in receivers a year or so after the introduction of IBOC receivers in the market. Such a lag in the introduction of the all-digital receiver allows us to optimize the all-digital system based on large-scale experience with broadcasting using hybrid systems.

While Lucent's current design of the FM all-digital system is capable of delivering roughly 200 kbps capacity in the main center-channel, we expect that optimizing the performance of the design over the next two years will yield a 50% capacity improvement to 300 kbps in the main channel. We believe that this gain in capacity and

spectrum utilization justifies our proposed 2-step approach for deploying digital receivers, consistent with the philosophy of maximizing the capabilities of a digital system that will serve the United States for several decades. We thus envision a transition from analog to IBOC hybrid to IBOC all-digital that is orderly, spectrum efficient and protective of consumer investment in hybrid receivers. While enhancing the value proposition to consumers in the long run, with capabilities allowing for multi-channel audio or high-bandwidth data services, the increased value realization also provides a higher level of incentives to broadcasters to migrate sooner to all-digital.

This proposed center-channel FM all-digital approach with sidebands also maximizes spectrum utilization, creating the maximum possible bandwidth with available state-of-the-art technology while allowing for co-existence of FM analog, hybrid and all-digital modes.

4. Flexibility/Auxiliary Capacity

In the *Notice*, the Commission seeks comment on whether a regulatory framework analogous to that applicable to DTV licensees for services ancillary to broadcasting would be appropriate for the radio broadcast services; and if so, the limits, if any, that should be applied to ancillary services. DTV stations, pursuant to specific Congressional authorization,⁹ may provide ancillary or supplemental services so long as such services do not derogate the free broadcast service, and are assessed a fee on their gross revenues for such use when the licensee receives fees or compensation from third parties.

⁹ See 47 U.S.C. §§ 309, 336.

In Lucent's IBOC system, ancillary data capacity in the channel dedicated to audio services is a by-product of efficient audio coding, and does not compromise audio quality. Therefore broadcasters should be permitted to provide program associated data services in whatever fashion they desire. In addition, individual content or format choices may allow for trading audio bandwidth for auxiliary data capacity without impacting the free broadcast service. Broadcasters should be encouraged to also offer services without constraints based on such available auxiliary capacity, and be permitted to reap the benefits of their choices. Such flexibility should be considered an important evaluative criterion for digital systems.

With respect to levying fees, the digital television example used by the Commission above is quite different on the facts. Faced with the possibility that the broad 6 megahertz television channel could be utilized to provide an array of wireless services in direct competition to those for which spectrum was being auctioned, such as point-to-point microwave and paging, Congress enacted provisions in the Telecommunications Act of 1996 explicitly requiring payment of spectrum-related charges for ancillary subscription-based services. Congress has not enacted such a statute for AM and FM radio. The bandwidth that will be occupied by digital radio broadcast licensees is substantially less than that used by television broadcast licensees, 20 kHz for AM and 400 kHz for FM, compared to 6 MHz for TV. Each television broadcaster requires access to a whole additional channel of spectrum 6 MHz in bandwidth in order to transition to digital television. This long-term channel loan presents an opportunity cost in preventing the spectrum from being used for other purposes during the transition period to digital.

In contrast, the AM and FM bands already are fully occupied in most areas of the country, and the new digital technology uses spectrum that cannot be used by analog signals yet protects all existing analog signals. IBOC will permit more extensive use of spectrum without allocating any new spectrum during a transition period. The DTV experience thus does not provide an analog for the imposition of spectrum fees on radio broadcasters. Imposing such fees would remove the incentives that exist for broadcasters to take the risk to develop new and better services and to invest in the equipment necessary for doing so.¹⁰

5. Extensibility

The Commission seeks comment on the importance of extensibility (headroom) to preserve a strong and competitive free, over-the-air broadcast system in a digital communications environment, and to ensuring that listeners receive the full benefits of DAB. We view the ability to progress with future technologies as very important, given the ever-accelerating pace of technological change. The maximum amount of extensibility (headroom) should be required of a digital radio system to ensure that it will meet the future needs of the public in a backward compatible manner. This will maximize the value of embedded consumer IBOC hybrid and all-digital receivers and minimize stranded investment.

Lucent's FM IBOC all-digital system, for example, is designed with a high throughput physical layer and a channelization scheme that would allow for allocating bandwidth to distinct wireless data services in channel increments of 16 kbps. Along with standardized application protocols, this allows third-party application and service

innovators the flexibility to scale their bandwidth requirements and layer new services on a standardized national datacasting platform.

6. Accommodation for Existing Broadcasters

In the *Notice*, the Commission tentatively concludes that any DAB system should, to the maximum extent possible, accommodate all existing broadcasters that desire to initiate DAB system transmissions; that while a digital service that permits both AM and FM stations to provide the same level of enhanced audio quality also would be of significant benefit to broadcasters and listeners, placing AM and FM broadcasters on equal footing in terms of signal quality is not an essential DAB technical requirement; and that a digital AM service that would provide “FM-like” audio quality would create important new format choices for AM stations and could help revitalize the AM service. Comment is sought on these views.

Lucent agrees with these views of the Commission on accommodating all existing broadcasters. Our DAB system is designed to maximize spectrum utilization very flexibly to accommodate the needs of individual AM and FM stations, particularly with regard to two specific aspects: timing of implementation and providing for individual station flexibility in configuring itself to address its own local market strategy.

Lucent’s tests demonstrate that it *is* possible to raise the audio quality of AM hybrid to be close to that of present day FM stereo. FM hybrid quality can approach that of CDs. IBOC is important to FM not only because of the potential for new auxiliary data services, *supra*, but also to provide audio quality comparable to that which satellite digital broadcasters are expected to provide with multiple channels distributed nationwide beginning next year.

However, use of 20 kHz channels in the AM hybrid mode does confine the amount of audio improvement that can be attained in that band (near FM quality), and requiring parity between AM and FM would unnecessarily constrain the quality that could be realized at FM. But the enhancements to AM broadcasting made possible by Lucent's hybrid mode will benefit broadcasters and the public immediately, and the significant improvements available in the all-digital mode far outweigh the limited compromises necessary in the near term in order to transition to an all-digital system using the hybrid mode. Consistent with our approach of providing maximum flexibility to broadcasters, our system design allows individual AM stations to tailor any near-term compromises in the AM hybrid system to their specific station needs.

7. Coverage

The Commission seeks comment on its tentative conclusion that the public interest would be served best by a digital radio assignment policy that adopts current analog protected service contours for DAB, rather than replicating existing signal coverage areas (which generally are more extensive unless limited by interference).

Lucent's AM and FM systems, both hybrid and all-digital, are designed to work within the existing protection rules. These rules must be maintained in order to provide an orderly transition to digital. The original assumptions upon which the rules are based are obsolete around the edges due to the measurably increased sensitivity of receivers in the 100 MHz range today, compared with the early 1950's when the basic rules were adopted. Therefore, where reception is not limited by interference from other stations, signals today can be received substantially beyond the protected service area (Grade B) specified in the Commission's rules. Existing stations can have substantial listenership in these areas. In addition, each new signal added to the band creates

additional service, but also creates an area of interference where neither it nor the pre-existing station can be heard. It is essential that during the digital transition the performance expectations of the public are met, and the public will judge this by whether they can reliably receive the digital signal of the analog stations to which they normally tune. Therefore, for purposes of comparing competing systems as well as for purposes of the Commission's rules, we strongly believe that one must consider the performance of the proponent digital systems based upon delivering a digital signal to existing coverage areas, not to just the protected contour. Our DAB system is capable of providing service to the current service area of all analog stations, whether noise-limited or interference-limited.

8. Implementation Costs

The Lucent IBOC systems use much of the existing station infrastructure, and consequently conversion costs for broadcast stations are expected to be very modest. For FM transmission systems, we estimate that a one-time upgrade cost to hybrid *and* all-digital will range from \$75,000 to \$150,000. For AM stations, the comparable costs will vary between \$20,000 and \$30,000 total for stations with a stereo transmitter of compatible linearity. Reasonable costs in this range should foster a rapid roll-out of digital service.

In addition, because the Lucent system is completely compatible with analog in both its hybrid and its all-digital modes, a federally-mandated required transition period is not necessary. This will permit broadcasters to initiate digital broadcasting in an economically viable manner as the marketplace dictates. Nevertheless, because of the inefficiency involved with dual analog-digital systems and receivers, we recognize that

at an appropriate time during the transition the Commission may choose to mandate the cessation of analog broadcasting.

Consumer receiver costs depend upon many trade-offs that manufacturers make when designing their receiver products. The consumer market has a wide variety of analog receiver operating specifications and associated costs, and we would expect the digital marketplace to reflect the same range. Lucent is designing integrated digital AM/FM receivers that would be affordable to the American public.

VII. IBOC AND NEW SPECTRUM DAB MODELS

The Commission requests comment on the advantages and disadvantages to implementing digital audio broadcasting by either of two models: IBOC, which is the method that has been developed by Lucent; and a new band of spectrum, such as television channel 6 (which is immediately adjacent to the FM band) or other bands. It requests comment on how it should balance the need to provide broadcasters with sufficient incentives to transition rapidly to DAB with the need to respond to the unmet demand for new entrants.

As discussed throughout these comments, Lucent believes that there are many, many advantages to using the existing AM and FM bands for an upgraded digital service. Paramount is the efficiency of redirecting existing spectrum for leading-edge technology and services, rather than not allowing its use to evolve as technology and services evolve. Harnessing the considerable experience of existing broadcasters will provide substantial public benefits by making available competitive digital broadcast services and programs that are supported by advertisers.

Continuation of the free over-the-air model for broadcasting, coupled with the intensely competitive supply of receiving equipment, makes available a wide variety of

news and programming to all members of the public without regard to financial means. This alternative to paid subscription programming affirmatively serves the purposes of the First Amendment and the public interest by ensuring that all citizens have access to news, weather, and entertainment programming almost without regard to financial means. The importance of this aspect of broadcasting should not be trivialized or misunderstood. In the increasingly diverse marketplace of subscription programming alternatives, such as satellite-delivered digital audio radio service, cable-delivered multi-channel services, and internet-delivered programming, free, over-the-air broadcasting should not be held back or discouraged from upgrading to digital technology and services by the Commission.

The Commission's goal should be to foster broadcast innovation and the delivery of new and improved services to the public at the lowest cost. This can be accomplished only by facilitating transition from analog to digital through an IBOC model. Whether new spectrum should also be devoted to broadcasting should *not* relate to the ability of existing broadcasters to enter the digital world, but rather, whether there exists demand for additional broadcasting. This subject should be addressed completely separate from digital migration of existing broadcasters because it raises an entirely different set of issues. In this proceeding, the focus should be on the feasibility of digital IBOC technology and the regulatory means that can be employed to foster a rapid and seamless transition from yesterday's analog to today's (and tomorrow's) digital.

IBOC MODEL

The Commission seeks comment on whether a workable IBOC system would be superior to a new-spectrum DAB system because: (1) IBOC would not require new spectrum; (2) it would permit a fast transition to DAB that preserves the benefits of the existing radio broadcast service while leveraging the considerable resources and expertise of the radio broadcast industry; and (3) IBOC systems may be able to provide enhanced sound quality, permit significant expansions in station service areas, and create opportunities to introduce a broad range of ancillary services. The Commission indicates that advances in compression technology may permit greater levels of information transmission, and thus, the introduction of new broadcast services. Additionally, it states that the enhanced robustness of IBOC systems could help eliminate or ameliorate interference now experienced by grandfathered short-spaced radio stations and other types of signal degradation suffered by many stations operating in difficult or congested RF environments.

The Commission also requests analyses of the minimum power levels that would preserve service within protected service areas in an all-digital environment, and alternatively, the levels that would not result in significant disruptions to current listening patterns. The Commission states that consideration should be given to the implications of an IBOC approach over the short-term transition period, when hybrid transmissions require greater bandwidth, and the long-term, when the absence of analog transmissions could open up spectrum for new entrants.

The Commission also requests comment on the relative time periods that would be required for rolling out service using an all-digital IBOC system as compared to a new non-IBOC system; on how to compare an IBOC to a new band system; and on the

spectrum efficiency implications of a new band approach as compared to an IBOC approach.

In its questions, the Commission has specified many of the arguments that augur strongly for adopting an IBOC approach to digital broadcasting. IBOC does not require any new band of spectrum and *is* very spectrum efficient. It also would leverage the resources and expertise of the existing broadcast industry. And it would bring new and improved service to the American public in the quickest and most reliable way.

With regard to demands for more stations, Lucent notes that on January 20, 2000, the Commission adopted rules that will permit up to one thousand new additional stations in the FM band using 100 and 10 watts of power¹¹ by permitting these stations to use third-adjacent frequencies the use of which heretofore has not been permitted. Lucent takes no substantive position on the need, or the lack thereof, for increased numbers of broadcast stations. This is an area of Commission expertise and responsibility, and should not dictate one way or the other whether existing broadcasters will be allowed to transition to the new digital technologies and services.

ALTERNATIVE DAB MODEL UTILIZING NEW SPECTRUM

The Commission specifically requests comment on whether the six megahertz of spectrum at 82-88 MHz currently used for TV Channel 6 should be reallocated to (non-IBOC) DAB service at the end of the DTV transition, and whether doing so would adversely affect the broadcast television service. Comment is solicited on all aspects regarding the use of the spectrum at 82-88 MHz, including tying the availability of the spectrum to the DTV transition. Commenters also are requested to indicate whether there are other frequency bands that might be more desirable for new DAB spectrum. The new spectrum approach would permit the use of a DAB system that is independent of the existing analog AM and FM systems. The Commission requests comment on whether this independence would provide greater flexibility in planning and implementing DAB service, such as facilitating operation at a higher data rate and supporting higher audio quality and enhanced ancillary services as compared to an

¹¹ Creation of a Low Power Radio Service, (FCC 00-19, adopted Jan. 20, 2000).

IBOC system operating in hybrid mode. The Commission seeks comment on transition issues involving the new spectrum approach and states that any reallocation of the 82-88 MHz band for DAB service should facilitate the transition to a final DAB spectrum plan that would include the existing FM radio spectrum.

In a new spectrum context, the Commission also requests comment on the appropriate bandwidth for DAB channels and asks: Should new spectrum assignments reflect the same channel assignment scheme currently used with the FM service? Would using the FM channel plan facilitate the eventual conversion of the existing FM stations to DAB operation, and a common FM/DAB radio receiver design across the entire 26 MHz of spectrum (from 82-108 MHz)? Would a common FM/DAB channel scheme and receiver design facilitate a transition plan in which existing FM stations could determine on their own when to switch to digital operation without regulatory intervention?

The merits of increasing the number of broadcast stations by allocating additional spectrum for broadcast purposes is a matter separate and apart from allowing existing AM and FM broadcasters to transition to digital by utilizing an IBOC system. Any consideration of the new band approach *as a substitute for, or in place of*, permitting existing broadcasters to transition from analog to digital using IBOC methods is counter to the public interest. The Commission should be a facilitator of new technologies and services being delivered to the public, including doing whatever is necessary to allow existing licensees to upgrade their facilities in a manner consistent with the overall regulatory scheme of broadcasting.

There *is* a clear spectrum management advantage for utilizing an IBOC approach to digital broadcasting, both as to efficiency and as to refarming existing spectrum

instead of allocating new scarce spectrum, as has been discussed above. These advantages are *not* offset by other factors.

For purposes of comparing audio quality and data delivery capacity, the final all-digital system is the most appropriate system to compare to new-band systems and technologies. New band options do not offer *any* long-term advantages over either the audio quality or data capacity of Lucent's proposed all-digital system. Lucent's all-digital FM system provides CD audio quality superior to that of older systems, such as Eureka-147. Perceptual audio coding (PAC™) offers higher quality per bit. Multi-streaming techniques offer greater robustness. The Eureka-147 system requires co-location of stations and sharing of transmission equipment and antennas, a station architectural design substantially different from the traditional distribution of individually-owned, operated, and situated stations in the United States. Eureka-147 also offers no raw spectrum efficiency gains over those of Lucent's all-digital system. Our system provides 4 bits/Hertz for AM, and 1.5 bits/Hertz for FM IBOC all-digital systems. Eureka's claimed throughput works out to 1 bit/Hertz.¹² While this metric for spectrum efficiency cannot be used in isolation, *supra*, Lucent's system also offers a superior audio compression scheme, and uses the most advanced error correction techniques available today.

Finally, each of the "new-band" approaches would encounter substantial delay and raise other difficult issues. Full access to television channel 6 will require delaying until completion of the digital television transition, which is statutorily targeted for December 31, 2006 but which may take even longer on a market-by-market basis, depending upon consumer uptake of digital reception equipment. Adopting this option

¹² See, EU-147, *Digital Audio Broadcasting System: Definition of the Ensemble Transport Interface*, Issue 4.0, March 1995.

also would require changes to the digital television Table of Allotments to find suitable UHF channels for any Channel 6 incumbents whose temporary UHF "loan" channel is above channel 51 (*i.e.*, in non-core spectrum), and continued television service to the far suburban and rural areas covered by most VHF channel 6 stations would require multiples of stations transmitter power. Finally, the "band edge" problem where adjacent television and radio stations meet would not be resolved – the problem simply would be moved from 88 MHz to 82 MHz. The potential for inter-service interference would remain the same.

In conclusion, the all-digital system designed by Lucent is based on twenty-first century leading edge technology. Indeed, some elements of Lucent's DAB systems were developed by it for its IBOC hybrid and all-digital systems and are being proven for the first time in laboratory and field testing. DAB using existing spectrum is feasible and preferable using Lucent's IBOC system, due to its ability to gracefully migrate existing stations from analog to digital while at the same time protecting consumer access to the broadcast signals using existing equipment.

VIII. STANDARDS AND TESTING

COMMISSION ADOPTION OF A SINGLE DIGITAL IBOC BROADCAST STANDARD IS THE ONLY PRACTICAL PATH FORWARD TO INITIATE DIGITAL BROADCASTING

The Commission seeks comment on the desirability of a single DAB transmission standard, and asks whether an "open architecture" approach is feasible; what the technical and economic impact of such an approach would be on the development and manufacture of DAB receivers; and whether advances in digital signal processing ("DSP") chip technology make a standard unnecessary. The Commission also solicits

comment on the likelihood that the broadcast industry would establish a *de facto* standard without Commission action; and whether the Commission could take action short of mandating a standard that would help industry establish a standard, such as by conferring benefits to licensees utilizing the standard¹³;

In earlier comments¹⁴, Lucent expressed strong support for *de jure* standards adopted by the Commission. We continue to believe that adopting a single standard is the only practical way to provide the certainty that licensees, receiver equipment manufacturers, and consumers require to invest in DAB technology and equipment. A standard serves as a coordinating mechanism that greatly facilitates a universally accessible, free, over-the-air advertiser-supported broadcast system that provides the latest services and greatly improved audio quality. Unlike the situation with wireless subscription services, all broadcasters, transmission equipment manufacturers, and consumer device manufacturers *must* cooperate if there is to continue to be a universal broadcast service. It is very optimistic and therefore risky to contemplate that the different industries – or even individual members of the same industry – will agree upon the attributes of a standard. But even if they were to do so, the Commission uniquely is able to ensure that the public interest in providing specific new digital services is considered and accommodated. In this manner the Commission can assure itself that the DAB standard will be designed to be capable of serving important digital public interest objectives such as emergency communications needs, traffic information, and severe weather warnings. These objectives are no less important for the radio industry

¹³ Notice at paras. 50-53

¹⁴ Lucent Technologies Inc., RM-9395, GEN Docket No. 90-357, Comments at 22 (Dec.23.1998); Reply Comments at 21 (Jan.25, 1999).

than for the television industry, where the Commission very specifically has addressed the public interest objectives of broadcasters.¹⁵ Given the universal penetration of radio, and especially its unique attributes of low power consumption and unequalled mobility, it is even more important that the DAB standard enable the types of services that would facilitate broadcasters providing needed services to the public.

The Commission's queries about "open architecture" receivers and advances in DSP chip technology indicate an interest in developments in what broadly may be referred to as the interoperability potential of "software defined radio" or "software radio." A software radio is one whose waveforms are defined in software. A software defined receiver employs a wideband analog-to-digital converter that extracts, downconverts and demodulates the channel waveform using software on a general purpose processor. This type of technology is just beginning to be developed and, while perhaps promising, is far from implementation as an affordable option for consumer broadcast receivers. At this stage of development, software radios and similar concepts are being considered in the context of wireless 2-way services where software implemented at base stations could "handshake" with units using different transmission standards and translate among the standards to permit interoperability. The prospects are unknown for implementing this concept in consumer broadcast receivers where there can be no two-way communication between consumer receivers and the transmitter, and no handshake as a result. Broadcasting is quite different.

¹⁵ See *In The Matter of Public Interest Obligations of TV Broadcast Licensees, Notice of Inquiry*, MM Docket No. 99-360 (FCC 99-390) (released Dec. 20, 1999)

Even if broadcast multiple standards were feasible today and available in the marketplace at not completely unreasonable cost, lack of a single standard still could freeze participants and lead to failure. The Commission should not wager the benefits of digital radio on the hope that a suitable *de facto* industry standard will emerge without substantial government participation and oversight. The experience with AM stereo¹⁶ proved that Commission adoption of a single standard for traditional broadcasting is needed because the supply of consumer receivers is independent of the investment in broadcast transmission infrastructure. This situation is unlike other industries such as wireless telephony, satellite DARS, and subscription video, where multiple standards are satisfactory due to the close coordination between network and subscriber equipment defined by the service provider.

We are unaware of *any* country anywhere in the world that does not mandate the standard to be used for universal, free over-the-air broadcast services. Indeed, in the case of AM Stereo, three equipment manufacturers – Sony, Sansui, and Sanyo – produced receivers capable of working with *all* of the AM stereo standards.¹⁷ Nevertheless, AM stereo was never successfully implemented, and did not revive even after an Act of Congress reversed the Commission's decision and ordered the Commission to mandate a standard, which the Commission did. However, by then the window of market opportunity to derive benefits from implementing AM stereo had long passed.

¹⁶ See Docket 21313, 47 Fed.Reg. 13152 (1982).

¹⁷ See Stanley M. Besen & Leland L. Johnson, *Compatibility Standards, Competition, and Innovation in the Broadcasting Industry* (prepared for the National Science Foundation by the RAND Corporation, Nov. 1986).

Thus today, with AM and FM broadcasters facing a need to upgrade to digital in order to stay competitive, it is clear that the Commission should participate in consideration of the elements of a digital broadcast standard and conclude by adopting a DAB standard (or its equivalent, technical requirements intrinsically related to the standard) to discharge its obligation to further the interest in free, over-the-air broadcast radio. As discussed *supra*, the Commission's involvement also is necessary to ensure that those who design the standard provide capabilities that will meet public interest concerns. Throughout the process, the Commission has a public responsibility to ensure that the standard selected is optimal for the public's needs and that the IBOC version works as claimed and adequately protects reception of the associated analog signal and the analog and digital signals of other broadcasters. Delay in acting will delay realizing the substantial economic opportunities for a variety of industries in designing and building digital broadcast equipment, and in providing new and improved digital services to the American public.

We also note that the National Association of Broadcasters (NAB) has endorsed a single digital standard since 1993: "For DAB to be successfully introduced in the marketplace, it is necessary to have a single standard. Technical standards are necessary to generate investment in manufacturing and confidence that the products will, in fact, perform as designed once they are manufactured."¹⁸

**THE COMMISSION MUST ACTIVELY ENGAGE IN THE DECISION-MAKING
PROCESS FOR DAB SYSTEM TESTING, EVALUATION AND TRANSMISSION
STANDARD SELECTION**

¹⁸ Resolution of the NAB Radio Board of Directors, June 23, 1993, Pentagon City, Virginia.

The Commission seeks comment on three specific evaluative models for DAB system testing and any alternative proposals. One model is the NAB proposal, under which the NRSC would test and evaluate competing IBOC systems, select a transmission standard based on industry consensus, and recommend a single specific standard to the Commission for adoption. Another is Lucent's proposal that the Commission actively participate with industry to ensure a fair and unbiased decision-making process. The third model on which the Commission seeks comment is Ford's for a public-private committee with open membership intended to achieve consensus and even recommend a specific transmission standard for adoption by the Commission.

Lucent does not see the principles of these three models as inconsistent or exclusionary of each other. Rather, all three can be incorporated into a single model, which Lucent would suggest would include all interested industry representatives, including members of technical organizations such as IEEE, SBE, and others, represented at and cooperating with the lead organization, which Lucent views as being the National Radio Systems Committee (NRSC). It is vital that the Commission's senior staff also actively participate in the work of this Committee, so that knowledgeable input can be had on public interest objectives and beliefs at an early stage when technical design changes are more easily accomplished. Further, in the current situation where traditional evaluation methods do not apply very well, the Commission plays a key role in ensuring that the process yields well-judged, qualified recommendations.

In the past, Lucent has expressed some concern with the NRSC as an industry organization that might give short shrift to certain types of proposals from outside the traditional broadcast community. However, other organizations have not shown the interest and ability to step forward and address these issues. In addition, at its January,

2000 meeting the NRSC Subcommittee on DAB determined, with but a single negative vote, to subject all proponent systems to rigorous, identical testing at common test sites to objectively compare their system attributes. Lucent has long advocated that such testing was essential to determining the strength of competing proponent claims. This is a very positive development and could lead efficiently to agreement on a DAB standard recommendation. The importance of such testing again can be understood in the context of the AM stereo experience. With AM stereo, attempts to accomplish rigorous, identical testing of the competing systems under auspices of an impartial third party were unsuccessful, partly because one proponent did not agree to such testing and partly because another one entered relatively late and was not ready for evaluation at the time of testing. Data supplied to the Commission by the proponents therefore were not obtained under common testing, making it impossible to compare systems. One FCC staff person correctly complained that "our selection committee was often forced to evaluate systems' performance from data taken under different conditions, not necessarily obtained with identical procedures, and not monitored by competing proponents."¹⁹ Some data were missing entirely.²⁰

We believe that these lessons from the AM stereo experience remain valid and applicable today. At this time industry constituents, through the NRSC, appear poised to avoid the mistakes of the past by insisting on proper and rigorous testing of proponent systems. Pursuant to the NRSC process a "Request for Proposals" would be issued to determine whether there are additional systems that meet inclusion in the

¹⁹ *Besen and Johnson, supra*, quoting from an FCC memo from L.C. Middlekamp to Chief Scientist titled *Selection of an AM Stereophonic System*, Docket No. 21313, dated March 17, 1980.

²⁰ *Id.*

comparative testing. Provided that the Commission agrees with industry and the Congressional intent behind the statutory mandate for adopting the AM stereo standard, digital audio broadcasting through refarming the existing AM and FM frequencies will become a reality.

Lucent will cooperate with the Commission and participate with the NRSC to make the benefits of digital broadcasting a reality for the American public in as short a time period as possible. In the event that the intended NRSC testing process does not go forward to completion for any reason, the Commission will have to consider how to independently test the systems to secure the technical information necessary to apply the Commission's evaluative criteria. Leaving broadcasters with only yesterday's analog systems in today's digital world contravenes the public interest in continuance of robust, free, over-the-air broadcast services and should not be countenanced as an option.

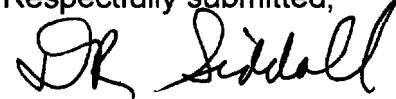
IX. CONCLUSION

The future holds much promise for both AM and FM IBOC systems. However, for broadcasters and the public to acquire the benefits of digital broadcasts as rapidly as possible, the Commission should exercise a leadership role in working with industry. Together the best possible standard can be devised that will serve the American public.

DIANE LAW HSU, ESQ.
Corporate Counsel
Lucent Technologies Inc.
1825 I Street, N.W.
Washington, D.C. 20006
(202) 756-7092

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Respectfully submitted,



DAVID R. SIDDALL, ESQ.
Verner, Liipfert, Bernhard,
McPherson & Hand, Ch.
901 15th Street, N.W.
Washington, D.C. 20005
(202) 371-6326

PHILIP L. VERVEER, ESQ.
Willkie Farr & Gallagher
1155 21st Street, N.W.
Washington, D.C. 20036
(202) 429-4740

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